1859 FIFTY-EIGHTH YEAR 1916

AMERICAN

GAS LIGHT JOURNAL

VOL. CV., No. 3. NEW YORK, JULY 17, 1916 WHOLE No. 3,045.

Temporary Pipes Along Curb and on Trestles Over Street Carry Good Part of New York City's Gas Supply During Subway Construction

Careful Study Given to Gas Main Handling Previous to Starting Construction—No Mains Are Left Alive in Great Caverns Under Street Decking—Experience Has Already Amply Justified Decision to By-Pass All Lines—Cave-ins and Wash-outs Would Have Been Serious Had Any Been Alive

By C. N. GREEN

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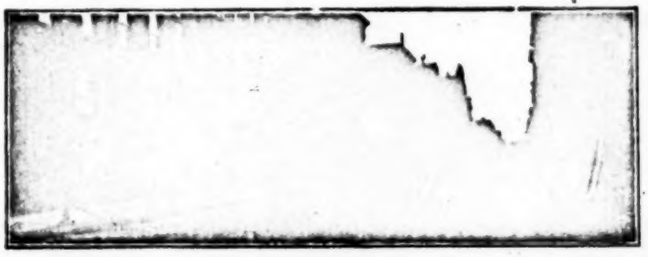


SUPPLY TO HOUSES AND BUILDINGS CARRIED IN GUTTER-MAINS.

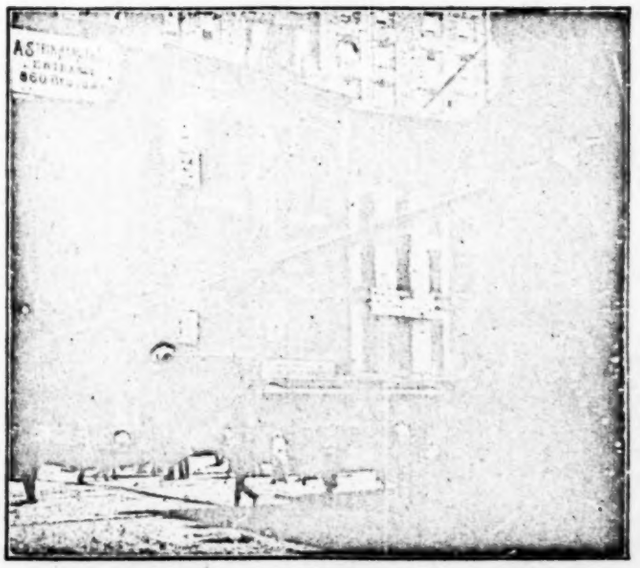
Careful consideration was given to the handling of the gas supplies in the affected districts in the planning of the New York City Subways now under construction. The first subway was carried on mostly in open cut. There was no covering over the excavations, and, consequently there did not exist the danger of explosions from accumulated gas that would exist were live gas mains permitted under the decking that provides a roadway over the present excavations. So, in that work, it was not imperative that the provision be made for the by-passing of the gas supply that was necessary for safety in the present work. No mains are left alive in covered excavations in the later construction. The supply pipes are all cut off, and the gas service continued to consumers along the way from by-pass mains laid in the gutters of the streets. These by-passes are carried around the curb corners and back into the transverse streets far enough to insure safety against a leakage of gas through the intervening earth, and into the excavation. They are then carried across the street, under ground, and into the excavation. Such mains as cross the subway lines are carried overhead on trestles or suspension cables.

Gutter Mains Carry Supply of Gas to Buildings

The gutter pipes carry the usual supply of illuminating gas for the houses and buildings along the street in which they are laid. The connection between the meter and the gas main underground in the street has been transferred to this pipe in the gutter and the supply of gas to the underground mains has been cut off. So, when the subway contractor puts his plank floor in the street, and begins to excavate beneath it, there is no gas in the mains to escape at leaky joints or on account of a broken pipe. If gas should escape into this excavation and mix with the air, forming an explosive mixture, it would only need a spark from the street railway, from one of the many underground electric wires, a lighted match thrown away, or other ways, to cause it to explode with terrific violence.

Such an explosion did occur in Boston during the construction of the subway in that city. Several people were killed and property was damaged. Philadelphia had a similar experience during the construction of the Market Street subway. In neither Boston nor Philadelphia was the gas supply transferred from the street mains to pipes laid above ground in the open air.

These gutter mains, or by-passes as they are called, are carried around the curb corners and back into the transverse streets far enough to insure safety against a leakage of gas through the intervening earth and into the excavation. They are then carried across the street underground and connected to the existing mains. The existing mains in the transverse streets are cut off when they cross the subway excavation, so that there is no gas beneath the decked-over excavation. The large mains, if they cross the subway excavation, are carried overhead on trestles or suspension cables, as was



PIPE SUSPENDED FROM CABLES OVER GALLOWS-FRAME

done at 112th Street and Lexington Avenue, and Seventeenth, Twenty-eighth and Thirty-second Streets and Broadway.

Trunk Mains Carried on Trestles Over Sidewalk

Where the trunk mains run in the street and parallel to the excavation, they are carried on trestles built over the sidewalk, as was done in Broadway, south of Canal Street, in Canal Street itself, and, for short distances, in Seventh Avenue. In some cases these trunk mains have been put out of commission or killed, and no by-pass erected to take their place. This has only been possible where there are other ways of insuring the service ordinarily performed by the main, as, for instance, where a main has been laid to be used in an emergency to guard against an accident cutting off the supply of gas from a particular district.

The by-passes are not laid with the idea of duplicating every main in the street, but with the sole idea of supplying every consumer with his normal supply of gas. To do more than this would be superfluous and cause unnecessary expense for what, at most, are only temporary structures.

Few realize the expense to which the Public Service Commission is going in thus protecting life and property, and to allow business to go on with as little interruption as possible. Work in the first subway was carried on in cuts open to the sky, and there was no need for by-passing gas mains. Later the work was carried on under decked-over streets at an additional cost of about 25 per cent. The by-passing of gas mains naturally followed and is an insurance to the city against the huge damage suits which can not be estimated should an explosion occur.

Trestles Not An Ornament

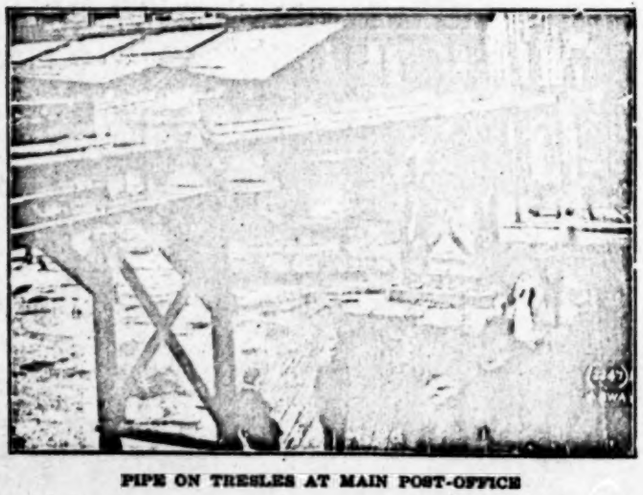
The trestles are not an ornament, nor are they an aid to business, but they are far better than an open cut excavation in the street, or an explosion that would do untold damage.

The engineers of the Public Service Commission have spent much time and study in an attempt to avoid trestles as far as possible, not only on account of the added expense, but to inconvenience business as little as possible, and, wherever a gas main could be dispensed with temporarily, it has been done.

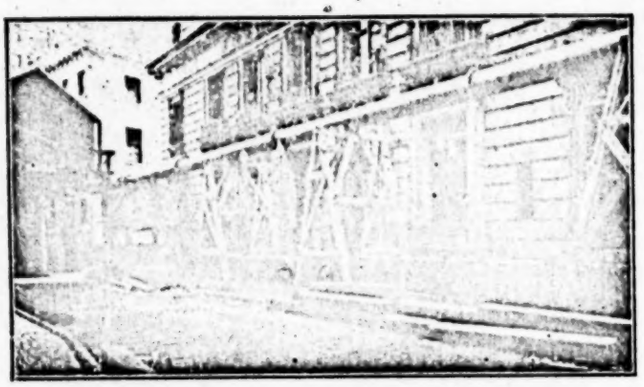
No great public work can be carried on in any city, be it great or small, without some inconvenience, but this has been cut down as much as is consistent with safety.

Plans for by-passing the gas mains are made in advance of the letting of the contracts just as is done for all other portions of the work, but unforeseen emergencies will arise, and while the plans are followed as far as the interests of the city will permit, if those interests demand a change, it is made.

The decision of the engineers to by-pass all gas mains has been amply justified already. A cave-in at Eighty-sixth Street and Lexington Avenue broke every main in the street twice. The recent washout at Canal and Varick Streets would have been most serious if gas had been in the mains. While the explosion at



PIPE ON TRESLES AT MAIN POST-OFFICE



30-INCH STEEL FLANGED PIPE ON WILLIAM STREET

Twenty-third Street and Fifth Avenue was in no way attributable to subway work, it shows what might happen in any excavation covered over, and with live gas mains beneath the covering.

Difficulty of Keeping Joints Tight

It is difficult enough to keep the lead caulked joints of gas pipe tight in the earth, but when they are disturbed in excavating and hung up on the timbering, some joints are sure to be strained and begin to leak.

An 8 inch gas pipe broken off in the excavation might, under existing conditions, deliver 1,000 cu. ft. of gas per minute. A 10 per cent mixture of gas and air has perhaps not a maximum explosive effect, but is assumed for convenience and is very near a maximum. This would make 10,000 cu. ft. of explosive mixture per minute. A subway cut 25 ft. deep and 60 ft. wide would contain 390,000 cu. ft. per block, so that theoretically, in 39 minutes, the block would be filled with an explosive mixture.

Practically, this would not be true as the gas would not diffuse itself with such rapidity, and the mixture would be higher in gas near the break in the main, and, perhaps, too low in gas at the farthest point to explode. Should the mixture explode the gas would burn where there is an excess, and probably set fire to the timber with results as disastrous as the explosion itself.

Gas mixed with air forms a compound which only needs a spark to show how violent an explosive it is. This spark might be furnished by the underground trolley or by one of the numerous cables exposed during the excavation, by a lighted match thrown away, by fire engines, or by sparks from a horse's shoe. In an excavation like the subway, blasting furnishes another means of igniting the gas-air compound. In some cases no cause could be assigned to the explosion. The violence of such an explosion has been shown when manhole heads have been blown into the air, and in numerous sewer explosions which have occurred in the last few years.

Responsibility for Explosions

Knowing the danger from gas while using such methods in excavating the streets, neither the gas company, which employs experts in their line nor the engineers for the city would be held blameless if an explosion should occur and every precaution to avert it had not been taken. Such was the reason for deciding not to leave any cast-iron main carrying gas under the decking unless properly ventilated by means of gratings, or protected by watchmen.

In mains to be killed the flow of gas was first stopped by inserting bags in the pipe and readings were taken to see if the pressure prescribed by the Public Service Commission could be maintained. The pressures were taken continuously for days, and if these readings were satisfactory the longitudinal mains were cut off and capped at intervals of two blocks. In the meantime, the by-pass pipes were laid in the gutter and connected up. These were 6, 8, 10 or 12 in. in diameter, according to the requirements of the different districts. Depending on conditions, one or two lengths of pipe were used to carry back in the transverse street and the turn at the curb was made with a pipe bent to fit the radius of the curb corner. The pipes in each transverse street were then cut and capped about 10 ft. back of the sheeting line on both sides of the proposed excavation. Connection was there

made with the largest pipe underground on each side of the street and the by-pass continued underground across the transverse street.

Generally there are from one to five pipes on each side of the transverse streets. Where there is more than one pipe on the same side of the street they are connected back of the caps with 1½-in. circulation connections, the vertical legs of which are tapped into the top of the pipe.

Little Attention Given To Levels in Laying First By-Passes

In laying the first by-passes little attention was paid to keeping the top of the by-pass pipes level or below the curb. As a consequence, numerous accidents occurred due to persons slipping or tripping over the pipe. In one instance, where the pipe did not lie close to the curb, a boy's leg was broken by being caught between the pipe and the curb. Now all pipes are laid close to the curb with the top not higher than the curb, even if it is necessary to remove the gutter stones.

Extra heavy wrought iron pipe has been used generally so that when the by-passes are removed the pipe can be used to relay the cast iron mains over the subway. The gas company has found this desirable, as the vibration from the passing trains loosens the caulking in cast iron pipes.

Large Pipes in Downtown Streets

In lower Broadway, from Canal Street south there are two mains 16 and 20 in. in diameter respectively, supplying the lower part of the city. These mains were by-passed during the building of the subway to Brooklyn, and the same methods were used during the construction of the subway from Vesey Street to Canal Street. Wrought iron pipes with flanged connections were laid about 14 ft. above the sidewalk. The trestle bents were so placed as to avoid entrances and interference with business. At cross streets where trestle bents could not be erected the pipe was trussed with wire rope anchored to it with clamps.

In 138th Street there are 16-in., 20-in. and 24-in. gas mains, forming a crosstown connection between the works and the lower west side of the Bronx. As these were within the sheeting lines, they were killed, and, to take their place two 24-in. riveted steel pipes were laid on trestles, one on each side of the street.

In various locations there are large feeder or pumping mains crossing the line of the subway. These mains were generally by-passed overhead, giving about 14 ft. clearance for the street cars and other vehicles. A description of one would be typical of all. The by-pass pipe is a 30-in. wrought iron riveted pipe carried on two gallows-frame supports back of the building line in the side street. Between these frames the pipe is suspended from two wire ropes carried over the gallows frames, and each is anchored back to a deadman. The deadman consisted of an inclined I-Beam carried well below the street surface, and with its lower end embedded in a block of concrete. The main in the street was bagged off, the pipe cut and a three-way and valve inserted in the line of the pipe. This operation was repeated on the other side of Lexington Avenue. The by-pass was then connected to the three-ways on either side of the avenue, the bags removed and the valve closed, to throw the gas into the by-pass and kill the main underground.

Cost of By-Passing

The cost of by-passing service mains, using 6 or 8 in. wrought iron pipe, laid in the gutter may be expected to vary but little from $50,000 per mile of street by-passed. The distribution mains requiring 16 to 30-in. by-passes, in general, run across the island front east to west, thus crossing most of the subway lines at, or nearly at, right angles. The cost of carrying a distribution main across the street on a trestle may vary from $1,000 to $10,000, depending on local conditions; the average cost, however, should be about $2,300.

After the construction of the subway and the restoration of the underground pipe, the by-passes are removed and the street restored to its original condition.

Refuses to Sustain Gas Company in Requiring Deposit from Some and Waiving it to Others

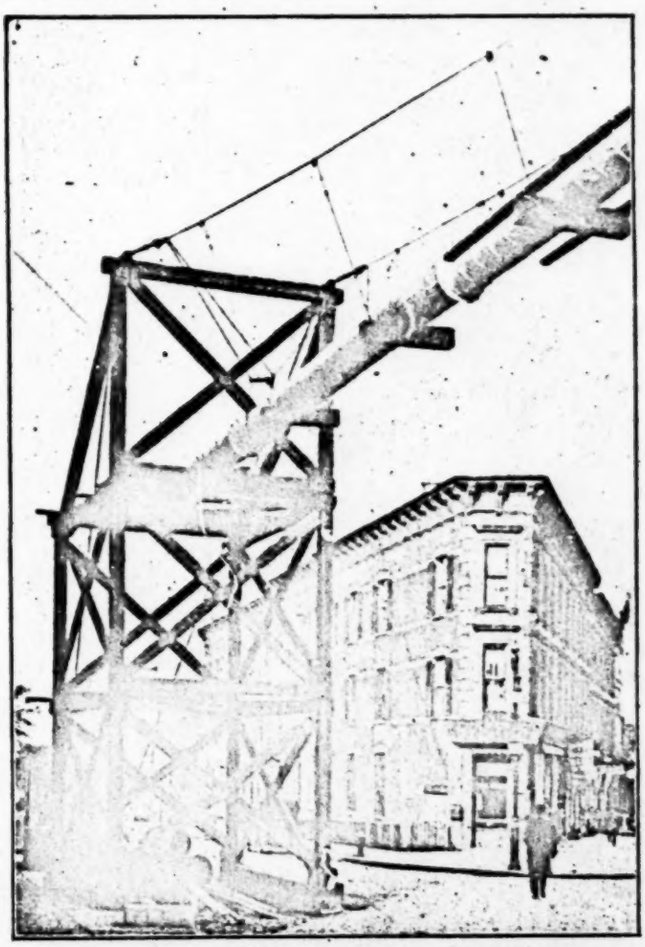
Pennsylvania Public Service Commissioner Declines to Uphold Company in Demanding Such Security on Grounds that its Rules Are Not Specific Enough to Prevent Undue Discrimination.

Commissioner Brecht of the Pennsylvania Public Service Commission, in a ruling handed down, July 8, refused to sustain the Peoples Natural Gas Company of Altoona in its present practice of requiring a deposit in the case of certain patrons and waiving it in others. The opinion was expressed that the practice of the company was irregular in not being specific enough in its rules to prevent discrimination and unequal treatment of different customers through the whims or caprices of those administering such rules.

Interest Paid on All Deposits

The ruling was on the complaint of J. B. Swoveland, who alleged discrimination was made in requiring certain patrons to make deposit before furnishing service. The complainant alleged that he made application to the company for gas to be supplied at his place of business, that the company refused to furnish the service requested unless the complainant would make a deposit of $10 or give security to insure the payment of bills, and that the company, in making such a demand for a deposit or security, is discriminating between him and other consumers of the city.

The testimony at the hearing before the Commission showed that The Peoples Natural Gas Company installed its plant in Altoona about April, 1913, and began operating the following August. Business was first conducted without asking for a deposit from patrons, but, owing to the rapid increase in the number of delinquent consumers in 1915, the company gave notice to its patrons that it would require a deposit or security from all patrons who applied for gas after March 1, 1915. Interest was to be paid on all deposits at the rate of 6 per cent per annum for whatever time the deposit remained in the hands of the company.



30-INCH PIPE OVER STREET-CROSSING ON FLATBUSH AVE.

Deposit Waived in Other Cases

Consumers known to the company to be financially responsible were not required to make a deposit or procure a person to guarantee the payment of bills.

It appeared that the complainant was a stranger to the company when he made application for service, and, being a tenant and not an owner, he was asked to make a deposit of $10 to get the service. The company later reduced the amount of deposit to $2 on learning that Swoveland's place of business was a one-story frame building, 11 ft. wide by 22 ft. long, containing but one room used as a shop and dwelling.

The complainant produced witnesses who testified that they, too, are tenants and have obtained service from the company without being required to furnish security. These were old patrons who always paid their bills promptly and were known to the company to be financially responsible.

The company's counsel showed that it is striving to keep the amount of deposits at a minimum and, therefore, when it has any means of knowing that the applicant will pay his bills the deposit is waived. In cases where a deposit is required at first the deposit is returned on demand after the consumer has given evidence of prompt payment of bills.

Ruling of the Commissioner

Commissioner Brecht pointed out that the point at issue arises from the manner in which the company applies its rule requiring security from certain of its consumers, and that the contention of the complainant is that the rule should be broad enough to apply to all consumers whether financially able to pay or not, otherwise the company is discriminating. Continuing he stated:

"The practice of the gas company in this matter is irregular and cannot be sustained. The rule is not specific enough to prevent discrimination and unequal treatment of different customers.

"Before a deposit can be legally required by the respondent it should publish and file an amendment, or supplement, to its rule on deposits, as it now appears, setting forth under what circumstances and conditions it will require a deposit or security from consumers, classifying them if need be and stating therein the amount of deposit required from the several classes. It should also specify under what circumstances, if any, it will exempt the consumer from the operation of the rule.

"There is no undue discrimination existing when a public utility makes a distinction as to security and deposits, but the rule must be clear and explicit so as to afford fair treatment to all, and leave nothing to the whim or caprice of the managers of the company in the administration of the rule."

No Real Prospect that Germany Will Lose Her Pre-Eminence as a Producer of World's Dyes

John Moody in his monthly review of conditions in the financial market points out the decline in the prosperity of the chemical industries in this country. "There is no real prospect," he states, "that Germany will lose her pre-eminence as a producer of the world's chemicals and dyes, and thus the declining tendency may fairly be taken to mean that chemical supplies outside of Germany are catching up with the demand, and that these supplies, plus the production of Great Britain, France, and the United States, may prove sufficient to last through the balance of the war."

New Dye Company Incorporations Increase Greatly in Number and in Capitalization in Last Two Years

Ordinarily new issues of the stocks of chemical and dye companies amount to possibly $1,000,000 a month, but, in 1915, the incorporations of such companies totalled $65,565,000. This record has been smashed during 1916 by the incorporation in five months of such companies with a nominal aggregate capital of $58,295,000.

Gas Demonstrations that Catch the Eye

The Utah Gas Company, Salt Lake City, Utah, appeals to civic pride in a very practical manner. The upper part of their large window is painted red, and here in letters of white one reads:

MAKE FOR A CLEAN CITY

USE SMOKELESS FUEL. GAS FOR COOKING AND LIGHTING.

On the base of the window is another sign:

THE USE OF GAS STOPS SMOKE

THE GREATEST KITCHEN HELP—ESPECIALLY IN SUMMER—IS A GAS RANGE.

The proof of gas efficiency is demonstrated every afternoon by a domestic science worker, who, gowned in spotless white, makes biscuits, cookies and cakes. The large window is fitted up to represent a sanitary kitchen, with linoleum in tile design. The furniture—chairs, table, sink, kitchen cabinet and gas range—are all of white enamel. Back of the window, on the interior of the store, are several rows of chairs, where women may rest and watch the demonstration at their ease, as the instructor explains both the mysteries of cooking and the superior advantages of gas as a fuel. A crowd always draws a crowd, and these women, sitting facing the window invariably attract a crowd on the outside, and thus double publicity is given to the gas demonstration.

The Peoples Gas Light & Coke Company of Chicago have a window draped with brown velvet. In the centre is a gas heater, with section removed to show the hot water coils. A card above it says:

FIFTEEN GALLONS OF HOT WATER FOR ONE CENT'S WORTH OF GAS.

Brown ribbons run from various parts of the heater to little cards pasted on the window which read: "Gas valve has needle point adjustment," "Burner top removable for cleaning," "Water jacket where water is pre-heated," etc. Each card fully explains the part to which attention is called, and by the time a spectator has read from top to bottom he has a good working knowledge of the compact little water heater, and can judge for himself the many advantages it possesses.

The self-lighting device is featured by the Grand Rapids Gas Company, of Grand Rapids, Mich. Against a background of curtains of silver grey is shown a fine gas range, with a sign above it, showing a hand pointing downward:

"PRESS THE BUTTON"

A larger card says:

GET A LIGHTER ON YOUR GAS RANGE

SIMPLY PRESS THE BUTTON AND A TINY TONGUE OF FLAME LIGHTS ANY ONE OR ALL OF THE TOP BURNERS. JUST AS CHEAP AS MATCHES. PRICE, INSTALLED, $2.25.

Another gas stove has suspended above it a large white pasteboard key, and a card leaning against the stove reads:

THE KEY TO KITCHEN COMFORT
THE GAS RANGE

OPENS THE DOOR TO EASIER AND BETTER COOKING. EASY TERMS.

A large hand on the window, with finger pointing directly at the passing crowd, says:

MR. HUSBAND:

YOUR WIFE WILL DANCE FOR JOY IF YOU GIVE HER A GAS RANGE. SHE WILL BE HAPPIER AND THE MEALS BETTER. PUTS AN END TO STOOPING AND BACKACHES. COME IN AND INSPECT THE VARIOUS STYLES.

The Gas and Electric Building, Denver, Col., is a practical demonstration of the efficiency of these methods of lighting, and at night is a constant advertiser of them. Instead of being outlined in light, as are those of a number of electric companies, the entire exterior of the building is studded with groups of lights arranged in scroll pattern. In large electric letters over the first floor are two large signs which say: "See our new special gas range," and "The gas water heater gives quick hot water." The corner window, draped with curtains of green velvet, holds a number of electric stand lamps with art glass shades, and among them are placed several gas hot water heaters, with a card:

HOT WATER IS A NECESSITY
SO IS A GAS WATER HEATER
GET ONE NOW AND ENJOY IT ALL SUMMER

Gas Would Supply Temperature Necessary to Keep Air, in Factories Ventilated by the Natural System, Within the Permissible Limits

Natural System Fails When the Temperature Difference Between the Top and the Bottom of the Room is Not Sufficient—The Use of Gas Would Supply the Deficiency—Great Advantage in Use Lies in Fact that It Would Always be Supplementary to Heat from Other Sources

Ventilating engineers have, apparently, paid little attention to the adaptability of gas for factory ventilating purposes. Considerable is heard as to the advantages of this or that mechanical system. Yet the natural system of ventilation is based on sound reasoning, and has given satisfactory results in service. It fails, however, when the temperature difference between the top and the bottom of the room is not sufficient to keep the air within the permissible limits of purity. The *Gas World*, of London, England, suggests the use of gas to supply the heat deficiency, and discusses the problem at length.

Ventilation a Complex Problem

The science of factory and workshop ventilation is very complex. Much depends upon the processes carried on, their liability to contaminate the air, and upon the number of persons engaged in a room.

It has been laid down by some authority that the rate of air motion through rooms should not exceed 5 ft. per second, and the proportioning of fans or other mechanical means must have regard to this.

There must also be a minimum of 250 cubic feet of air space per person employed. Each person when working will produce, on the average, 1 cu. ft. of carbonic acid per hour.

Allowing 4 parts of carbonic acid per 10,000 as being already present in the air, it would be necessary, at the ratio of space per person named, to change the air five times per hour to keep the carbonic acid content down to 12 volumes in 10,000.

Still, with such a rate of air change, it is quite practicable to keep the rate of traverse within the recognized limits. All that is necessary is to have the air inlets of sufficient area for the volumes of fresh air required. The outlets must be carefully proportioned, or draughts might ensue from over-ventilation.

Problem Becomes Acute When Necessity of Freeing Air from Dust, Fumes and Vapors Has to be Reckoned With

The complexity of factory ventilation becomes more acute when, in addition to contamination from the respiration of workers, dust, fumes, or vapors have to be reckoned with. It is desirable that the air be kept absolutely free from fumes or particles of dust.

A great deal depends upon the rate of diffusion of impurities and the specific gravity of dust particles as to whether they are readily amenable to extraction by a vitiated air duct. It was laid down by the departmental committee on factory and workshop ventilation that, "wherever possible, dust, fumes and evil-smelling vapors should be dealt with at the point of origin, and never allowed to mix with the general atmosphere of a room." Failing this, they advocated that the general ventilation should be increased to such an extent as to dilute the impurities sufficiently. They recognized that this was apt to be very unsatisfactory, as it might expose workers to an intolerable amount of cold and draught, and provoke dust to motion which might otherwise subside at the point of production.

It is not conceivable that two fans, one at each end of a room, drawing from a duct extending half the length, even though the latter be freely provided with openings to the room, will effectively and perfectly remove not only foulness due to respiration, but also the impurities enumerated. It will doubtless do something towards this, but must fall short of the dictum that "the air must be not only free from impurity, but must be at the same time moist, dry, warm or cold—in fact, any temperature attainable at will." The difficulties of the problem of ventilation are sufficiently well known without resorting to claims incapable of fulfilment.

Gas for Factory Ventilation

Having examined the general arrangement of a common type of factory ventilating system, the question may now be interposed, "Why cannot gas be utilized for removing the foul air of factories and workshops?" The natural system is admittedly satisfactory where no great degree of contamination exists. What makes it satisfactory in these cases? The fact that the air at the top of a room is usually at a higher temperature than the air at the bottom, and in any case the air in the room is at a higher temperature than the air outside.

Under these circumstances the provision of an uptake shaft enables a current of air to flow upwards from a room if adequate inlets are provided for like volumes of fresh air. The heat used to warm a room or that given off by the human beings or moving machinery within it, further accentuates the temperature difference between the inside and the outside air and increases the ability of the natural system to comply with the requirements of ventilation.

Why, then, does the natural system fail when the ventilating requirements become more acute? Simply because the temperature difference is not sufficient to keep the room air within the permissible limits of purity. If this line of reasoning is accurate, the obvious inference is that if the deficiency of heat can be imparted to air as it passes to an uptake shaft the natural system with this external aid, need not break down.

Gas Not Impracticable

Is gas impracticable? The last report of the Ventilation Research Committee of the Institution of Gas Engineers indicates that it is not. If ventilating ducts can be provided in factories for mechanical systems of ventilation they can be provided for gas systems of ventilation; and, as factories exist primarily for profit-earning, and not for the artistic appearance of the internal arrangements, there should be considerable scope for combining the lighting with the ventilating schemes. At any rate, gas used for ventilation might easily be made to render its quota to the artificial lighting required.

In a mechanical system which we have examined there is a horizontal duct extending, with a division plate in the centre, from one end of the room to the other. The propulsive force is placed at the outlet, and therefore farthest away from the point where the result, a pure atmosphere, is required.

With gas applied to ventilation the propulsive force would be placed at the inlet or inlets. These might be several in number, extending a few feet downwards from the ceiling with a grate opening at the ceiling or a little below, and delivering into a common horizontal duct.

At the outside wall the duct would be carried vertically to a point above the ridge of the roof, and, where a factory consisted of more than one room in height, this vertical portion could be made the common out-take for all except, possibly, the top room.

Just as the mechanical system requires careful proportioning, so would a gas system require it. Another point that requires attention is the best form of tube adaptable for factory work, bearing in mind shape, insulation, material to be used in its construction and jointing. So-called ventilating engineers have, apparently, given little regard to the adaptability of gas for ventilating purposes. It is left, therefore, for those engaged in the industry to see this matter through for themselves.

Cost of Gas as a Means of Ventilation

As to the efficiency of gas properly applied there seems little room for doubt. Will it, by comparison with other systems, be costly? The heat from one cubic foot of gas will raise the temperature of 2,50^ cu. ft. of dry air from 40 degrees to 50 degrees Fahr. There would be a certain amount of heat loss by conduction in ventilating ducts, but, having regard to these figures, there seems good ground for believing that, on the point of cost, gas has far greater possibilities than any other system.

It is readily adjustable, the simple turning of a tap increasing or decreasing the rate of flow of the air heated. It has the great advantage that it is always supplementary to heat from other sources which in itself is conducive to up currents, and is merely an extension, and not a replacement of the natural system. To provoke wide attention to it an endeavor should be made to get an actual installation at work on a large scale, from which unimpeachable data could be derived.

Gas Has Its Limitations

Gas, doubtless, has its limitations. It could not be used for atmospheres affording any possibility of dust being present in explosive quantities. It would be necessary, too, to prevent the deposit of inflammable dust in ducts used in the system of extraction, otherwise, in case of fire originating from other sources, the duct might form a ready means of extending its ravages. That would depend largely upon the material used in the construction of the duct pipes or passages. It should be possible to find a non-corrosive, non-inflammable material of fire-clay or other substance that would meet requirements.

Steel air ducts are used in the mechanical system referred to. The cost for a factory fourteen windows long, eight windows wide and four stories high is given as approximately $2,000. A good deal could be done with that sum in the direction of making gas effective as a means of ventilation for a factory of the size given.

Actual Yield of Ammonium Sulphate Falls Far Short of Theoretical Maximum

Prof. Thomas Gray Discusses Formation of Ammonia in Address Before Waverly Association of Gas Managers—Gradual Heating Gives Increased Yield

The suggestion that an increased yield of ammonia would result from the admission of a regulated current of water gas at the bottom of the modern vertical retort is worthy of serious experimental trial, in the opinion of Prof. Thomas Gray, of the Royal Technical College, Glasgow, Scotland, as expressed in a recent address before the Waverly Association of Gas Managers. Among the points brought out in his paper are the following:

Nitrogen Content of Coal

Coal contains from 1 to 2 per cent of nitrogen in the form of nitrogenous organic matter, regarding which little more is known than the fact that it undergoes decomposition under the influence of heat, with formation of ammonia. An average British coal may be assumed to contain approximately 1.4 per cent of nitrogen and would yield the equivalent of 148 lb. of ammonium sulphate, if it were possible to convert the whole of the nitrogen into ammonia. The actual yield under practical working conditions falls far short of this theoretical maximum, and varies greatly according to the character of the coal and the temperature and duration of heating.

While coals rich in nitrogen give, generally speaking, the largest yields of ammonia, there does not appear to be any connection between the nitrogen content and the amount of ammonia produced, but it has been proved that the more recently-formed coals decompose at a lower temperature than the older coals, and that they give a larger proportion of their nitrogen in the form of ammonia.

Temperatures Necessary for Maximum Production

According to Anderson and Roberts, the temperature at which evolution of ammonia begins ranges from 662 deg. Fahr. in the case of the younger coals, to 896 deg. Fahr. for anthracites. But experience in carbonizing coal on a large scale shows that much higher temperatures are necessary for the production of the maximum yield of ammonia.

Thus Lewes reports that the weight of ammonium sulphate obtained in the "Coalite" process averaged only 12 lb. per ton of coal carbonized at 786 deg. Fahr., whereas the maximum yield in a horizontal retort is stated to correspond with a gas make of 9500 cu. ft. and a temperature between 1470 deg. and 1650 deg. Fahr. As the temperature of carbonization is raised beyond these limits, the ammonia yield falls steadily.

This finds an explanation in the results of the experiments of Ramsay and Young, who report that ammonia begins to decompose somewhere in the neighborhood of 932 deg. Fahr., and that it is practically completely decomposed into its constituents, nitrogen and hydrogen, if subjected to prolonged contact at 1436 deg. Fahr. with suitable heated surfaces, such as asbestos and iron. Though the effects of carbon and fire-clay were not investigated, it is probable that prolonged exposure to contact with these materials at 1472 deg. Fahr. would destroy the ammonia equally effectively, and, at first sight, it would appear difficult to explain the survival of the ammonia in the retorts. But this difficulty disappears when the conditions are studied more closely.

Dilution With Steam Affords Additional Protection to Ammonia

In the earlier stages of carbonization the ammonia is accompanied by relatively large volumes of tar vapors and steam. The former, in the course of their passage through the retort, are largely decomposed, with the formation of secondary products, such as the hydrocarbons of the benzene series, naphthalene, free carbon, pitch, and permanent gases. The formation of these new products involves an absorption of heat, thus exercising a cooling effect on the inner walls of the retort, which is further intensified by the high specific heat of the steam.

The mere dilution with steam, tar vapors, and permanent gas also affords an additional protection to the ammonia, as actual contact of the particles of the latter with the heated surfaces is thereby minimized. It is only towards the end of the carbonization period, when the temperature of the charge is approaching that of the retort, that the conditions necessary for the more or less complete decomposition of the ammonia prevail, and, at this stage, the evolution of ammonia from the retort practically ceases.

Effect of Temperature

When considering the effect of temperature, it is important that the influence of the mass of coal in the retort should not be lost sight of, since this will determine the internal temperature during a considerable portion of the carbonization period.

Christie showed that gradual heating gives an increased yield, and we may assume that carbonization in bulk, as practiced in the manufacture of coke, will yield a larger proportion of the total nitrogen of the coal in the form of ammonia. This inference appears to be justified by practical results, though the high yields of ammonia—up to 36 lb. per ton of coal carbonized—so far as they are not explained by a high nitrogen content of the coal, are probably greatly due to the influence of the relatively large proportion of water in the washed coal.

Distribution of Nitrogen

The distribution of nitrogen among the products of distillation has been the subject of a considerable amount of experiment, which cannot be discussed here in detail, but reference may be made to the extensive series of tests by Macleod, who examined the products of distillation from eighty different coals, which were carbonized in horizontal retorts under ordinary working conditions.

His average results show that of the original nitrogen in the coal, 17.1 per cent, was recovered in the form of ammonia, 1.2 per cent as cyanogen, 3.9 per cent as nitrogenous substances in the tar, and 19.5 per cent as free nitrogen in the gas; whereas from 30.2 to 89.6 per cent (average, 58.3 per cent) remained behind in the coke.

A noteworthy feature of these, as well as of the original experiments of Foster and succeeding workers, is the large proportion of nitrogen retained by the coke, amounting, roughly, to one-half of the original nitrogen in the coal.

Various attempts have been made to recover this. In 1883, Tervet showed that ammonia was formed when hydrogen was passed through the red-hot coke which remained after the volatile matter had been expelled from coal at a red heat, and under favorable conditions, he succeeded in getting the equivalent of 57 lb. of ammonium sulphate per ton of coal.

His results were subsequently confirmed by Beilby, who proved the possibility of recovering about 70 per cent of the total nitrogen in coal by gasification of the latter with air mixed with a large excess of steam, and thus anticipated in actual working practice the method of producing power gas which was subsequently developed by Mond, by means of which 70 to 90 lb. of ammonium sulphate are regularly produced per ton of coal gasified.

Since the Tervet reaction proceeds comparatively slowly, there is little prospect that the introduction of hydrogen (or water gas, which the discoverer found to have a similar action) into the horizontal retort, at the end of the carbonization period, for the

purpose of recovering a portion of the residual nitrogen, would prove remunerative. But the suggestion of the late Professor Lewes, that an increased yield of ammonia would result from the admission of a regulated current of water gas at the bottom of the modern vertical retort, appears to be well worthy of serious experimental trial.

The use of steam—involving, as it does, the gasification of the coke—is obviously not applicable to gas-works practice, in which coke is produced as a by-product.

The reactions just referred to, while they have not yet been directly employed in gas-works for the purpose of increasing the ammonia yield, nevertheless play a very important part during the carbonization of coal.

The ammonia which is formed during the earlier stages of the distillation is evidently a primary product, but, as the heat penetrates the charge, water still present in the interior is vaporized, and, along with the water vapor which results from the decomposition of the coal, passes through the highly heated, more or less completely carbonized, outer skin, and is partly decomposed by the carbon, with formation of carbon monoxide and dioxide, while the hydrogen liberated from the water unites with the nitrogen of the coke to form ammonia.

At a later stage of the carbonization, when hydrogen is being evolved freely, the Tervet reaction comes into play, and continues throughout the remainder of the period, though the ammonia which is formed towards the end of the process is probably largely decomposed during its passage through the retort. The increased yield of ammonia at high carbonization temperatures is attributed to these secondary reactions, and principally to the action of hydrogen.

Yield of Ammonia In Different Systems of Carbonization

The yield of ammonia in the different systems of carbonization, expressed in terms of sulphate, ranges from about 20 to 36 lb., and from coal distilled in horizontal retorts is usually 24 to 26 lb.

In the present state of our knowledge of the subject, there is nothing to indicate a prospect of any substantial improvement of the ammonia yield, but a similar criticism of the still prevalent system of recovering this product from the gas, which involves the handling and storage of large volumes of liquor, with the attendant unavoidable loss of ammonia and the transport (often to considerable distances) of a dilute liquor containing only 2 per cent of valuable material, can scarcely be justified.

A more general adoption of the semi-direct process of recovering ammonia from the gas in the form now practiced in some of the smaller gas-works, is desirable, and the proposal to combine a direct system of ammonia recovery with arrangements for the fractional condensation of the tar on the lines suggested by Purves, appears to call for the serious consideration of the gas engineer.

Most Consumers' Complaints Regarding Inaccuracy of Meters Simply Imagination

Some consumers are prone to everlastingly complain that their meter is wrong. Most of this is simply imagination on their part, asserted W. L. Munro, auditor for the Dominion Natural Gas Company, in an address at the recent annual meeting of the Doherty Association of Canada.

"Explain to them that the gas meter is a well tried out and proven piece of mechanism and that the history of the gas business has shown that they are invariably more accurate than watches," he continued. "State, if in the Canadian properties, that the company has to pay the government a fee for testing and proving each and every meter before it is put into service, and also for re-testing it every five years.

"If this does not satisfy them, explain that the company is willing to have the meter changed and re-tested, providing they deposit an amount sufficient to cover the inspection fee and the cost of labor and material necessary to make the change. If the meter proves over two per cent. fast, they will be reimbursed for the overcharge for the past ninety days' account, and the company will bear the expense of the test and change.

"On the other hand, if the meter proves over 3 per cent slow they will have to pay the undercharge for the past ninety days and bear the expense of the test and change.

"This will show them that the company is willing to satisfy their complaint on a fair business-like basis, but is not eager to change meters indiscriminately, just to satisfy whims and fancies."

Use of Catalytic Agents in English Toluene Production Has Met With Success

Their Exact Action, However, is Doubtful—Usually Possible To Obtain About Five Times as Much Benzene as Toluene From Average Coal

The obtaining of a maximum output of toluene is at present one of the most interesting problems before those whose business is the distilling of coal in England. D. R. Wattleworth, in the *Journal of Gas Lighting and Water Supply*, discusses the methods used in that country as follows:

To increase the supply of toluene, the "C" process has been introduced at a great many gas-works in the country, and, though washing with tar is by no means an ideal method of recovering this hydrocarbon, yet the amount recovered in this manner must have materially added to the former production.

To recover the toluene present in town gas was the obvious way of increasing the production, but the problem has also been set about in a more scientific manner, and various schemes have been put forward to increase the amount of toluene actually produced in the distillation of coal.

A great many of these schemes are merely blind guesses at what "might" happen if certain compounds are mixed with the coal, or certain conditions as to temperature are observed during its carbonization.

From published figures, the use of these so-called catalytic agents seems to have met with a certain measure of success, but what is their exact action is very doubtful indeed. Yet there must be some conditions in the retort or oven which govern the production of toluene.

Some coals, distilled under standard conditions, yield more toluene than others, but our knowledge of the actual constitution of coal is so limited that at present we cannot look for much light to be thrown upon the subject from this quarter.

Ratio of Benzene to Toluene Production 5:1

From an average English coal, it is usual to obtain about 1 gallon of benzene and about 1-5th of a gallon of toluene, when treated under ordinary gas-works or coke-oven conditions. That is, the ratio of the benzene to the toluene is about 5 : 1. Why should this be so? Why should not more methyl groups enter the benzene ring, and a greater proportion of toluene thus be formed? Is it because of an equilibrium being set up? What splendid opportunities for research are presented in these three queries!

The formation of these aromatic compounds has already been the subject of much research and many theories, but nothing which can be of any practical help to us in our present position seems to have been brought to light.

One popular theory is that these aromatic compounds are pyrogenetic products of acetylene. That acetylene does form aromatic compounds on being heated is readily shown by heating some acetylene over mercury, in a bent glass tube, up to a dark red hot. A reduction in volume takes place, and benzene, naphthalene, styrolene, retene, etc., are produced.

In the presence of allylene, the next homologue of acetylene, methylated compounds—such as toluene, xylene, etc., are also formed.

Whether the aromatic compounds are actually produced in this manner, in the distillation of coal, is still a question, however, as some authorities assert that acetylene is not produced in the retort except at the highest temperature, while Lunge is responsible for the statement, "that at a lower temperature, less permanent gases and more methylated derivatives (toluene, xylene, higher phenols) are formed."

Possibilities of Impurities Acting as Catalytic Agents

That, under present conditions, the question is entirely one of temperature is no doubt the case, but the possibilities of the action of substances added to the coal, or present as impurities, acting as catalytic agents, present a very wide field for research.

It is more than possible that the experience already gained in connection with the many recovery plants now working, both of the "C" and oil-washing type, would, if collated, give us some valuable information upon this, at present, obscure subject. Figures showing the yield from the same class of coal, treated in various forms of retorts and in coke-ovens (with lime or limestone additions, and without) results from coals containing chlorides, and from coals free from chlorides, and so on—all, if gathered together, would supply us with valuable data.

AMERICAN
GAS LIGHT JOURNAL

FIFTY-EIGHTH YEAR.

Published Weekly by
AMERICAN GAS LIGHT JOURNAL, INC.
42 Pine Street, New York, N. Y.

ELBERT P. CALLENDER, President.
STANTON G. KRAKE, Vice-President.
FREDERICK A. SOUTHWORTH, Treasurer.
CHARLES H. WADELTON, Secretary and Manager.

EUGENE C. MILES, Editor.

Subscription, $3.00 per year, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines.
In Canada, $4.00. Foreign, $5.00.

Entered at the Post Office, New York City, as Second-Class Matter.

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The Sale of Appliances and the Ultimate Goal

When a gas company goes into the business of selling ranges, fixtures and other appliances, its ultimate goal is the increased use of its primary product. But, too often, in the heat of an enthusiastic selling campaign, this fact is overlooked. This is most unfortunate. The plumber or the hardware man can call it a job when he has sold a range, but the gas company cannot. Its real business being to sell gas, its efforts towards making that fuel a desirable one for domestic use must be never-ending. For that reason it must combine service with the sale of the fixture. The latter is but a step towards an increased use of its principal product.

The combination of salesmanship with service has never been more thoroughly worked out than it has been in the automobile field. It is a well known fact that in the case of a popular, reasonably-priced and excellently built passenger car many sales have been lost merely because it was known that the company fabricating it did not also handle its own repair parts. The general run of automobile manufacturers are too assiduous in making easy the upkeep of their sold cars for the prospective purchaser to be long undecided as to whether he will purchase a car whose repair parts are made by a firm which is just as much interested in its satisfactory performance as he is and which is earnestly solicitous in seeing to it that the inconvenience of breakdowns and failures of parts is reduced to a minimum.

The gas industry in its present unfinished state as regards the matter of service, can learn much from the automobile industry. This accomplished, the gas company should do more.

In the case of the automobile, service begins with the sale of the car. In the gas industry it should begin before.

It is to the interest of every gas company to co-operate earnestly with the manufacturer of appliances and fittings to the end that every shortcoming and weakness in his product may be totally overcome or greatly improved upon in the shortest possible space of time. The gas range, for instance, has not by any means been brought to the highest possible state of efficiency. When it has, if that time should ever come, the total annual sales of gas for domestic fuel will increase materially and there will be some gray hairs developed in the electrical field. The manufacturers have made splendid progress and undoubtedly will continue to move forward with rapid strides. But if every gas plant manager and every gas engineer would make it his business to study the product of the manufacturer from the vantage point he possesses of seeing it in use, and do some gratuitous thinking for the manufacturer, this progress would be increased by leaps and bounds.

It is to the gas companies' interest that no range or fixture should be installed in the premises of any of their consumers unless it be the best that is obtainable at the price the owner is willing to pay. To that end gas company officials should keep thoroughly in touch with developments and improvements in the fixture and appliance field. They should be as well informed in regard to the mediums through which their gas is used as they are in regard to the most modern and economical methods of the manufacture of their product. Their ultimate object being an increased consumption of gas, they should spare no effort to make that product desirable as a fuel in every possible manner.

To that end they should advise with prospective patrons in regard to the best possible installation. They should make the interest of that possible consumer their own primary interest.

Above all, they should have no axe to grind. Their advice and counsel should be absolutely disinterested. This service should be rendered whether the appliance is to be bought from the company itself or through a dealer.

Once the sale is made and the fixture installed, they should see to it that the appliance lived up to what they had said it would do. They should not wait for complaints, but should be, themselves, the most exacting complainers. By this it is meant that the performance of that fixture should be made a matter of regular record. To the duties of the meter reader the matter of making inquiries as to the service installations were rendering might be added.

Defects should be promptly and effectively remedied. The user should be relieved of even the slightest inconvenience or bother. Gas service should be made a perfect service; a service that means all worries removed from the shoulders of the buyer.

Handling the Gas Supply During Subway Construction

Subway constructon is either underway or contemplated in the near future in other cities than New York. With its advent comes the necessity of caring for the gas supply, during the building, and its replacement after completion. Gas engineers will therefor be interested in the description of the manner in which New York City is handling these problems, which appears on page 33 of this issue.

The devising of means of caring for the gas supply during the progress of such work is just as much the concern of the gas company engineer as it is that of the municipality or government body in charge of the work. The New York companies whose lines are affected in the work now underway represent a capitalization of many millions of dollars. They can afford to, and do, employ the highest grade of technical intelligence. It cannot be doubted that all the knowledge that they possessed was offered in devising the system of handling the gas supplies that is now in use. Likewise, on the engineering staff of the Public Service Commission there are men who have studied these problems for many years, and who have had the benefit of an extensive experience on similar work. The energies and skill of all these men, too, are represented in the solution as described in this article, and in others which will follow.

Subway construction in other cities will doubtless be carried out along somewhat different lines than those of the New York work, and other problems will be presented, but, a careful reading of the description herein given will, nevertheless, be of value to the gas engineer who may at sometime be called upon to assist, or direct, the solution of similar problems in other cities.

Dyes by Submarine

The recent arrival at the port of Baltimore of a German submarine, bringing a cargo of dyes and chemicals, has aroused widespread discussion throughout the country. The announcement that others are to follow has given rise to a belief in some parts that Germany, alarmed at the prospect of the establishment of a dye-producing industry in this country, is prepared to go to desperate lengths to smother the development in its infancy.

Whether this assumption is fanciful or not, there can be no doubt that it would be the logical and natural thing to do. The establishment of such an industry here would be a national calamity to that country, and no man or nation would, under normal conditions, sit calmly by and see his, or its, best market usurped by some other without making some effort to retain it.

This journal, however, does not believe that any dye producer is very much worried over the prospect of "dumping" via submarine. His fears reach out farther—to the time when the European war ends, and the products of Germany come pouring into the country in the holds of great merchantmen, rather than to the intermittent and uncertain competition of producers who must depend on so new a development as the submarine to carry their product to market.

This present arrival may represent the beginning of a regular wartime, transatlantic service, or it may be simply a diplomatic ruse put forward by some statesman, whose mind or purpose it is beyond the powers of the ordinary gas man to fathom. But it does emphasize one fact, and that most clearly—there is no time to be lost in enacting legislation that will protect the growth of an industry that is so vital to the welfare of this country. The American dye producer should be given every aid and encouragement to justify him in investing the capital necessary to develop his industry.

Are You Doing Your Part?

Astonishing though the revelation may be to the gas man in general, there is a rather deep-seated notion in the mind of the general public that the gas business is a dying industry—that its days are numbered. Engrossed as he is in his great task of developing new outlets for his product, and improving his service to the old, the industry seems to the gas man a very live factor, as indeed it is. Never, during its entire history, did it face brighter prospects for the future than it does to-day, with the tendency that is manifest towards reaching out into the industrial fuel field, and the almost certain establishment in this country of a great dye-producing industry.

If confirmation of these facts be necessary, one has only to point to the statistics compiled by the National government, covering the developments in the five-year period between 1909 and 1914, which were published in last week's issue of this journal. These facts speak for themselves, and are the most emphatic proof that could be given that the gas industry is merely in its infancy; that future developments will dwarf any that have been accomplished, or even been dreamed of, in the past.

But the public, in general, does not read government statistics. It is dazzled by the mushroom-like growth of the electrical industry, and the nation-wide advertising campaigns of manufacturers of electric appliances. It sees the gas lights disappearing from the streets of some of our principal cities and derives the idea therefrom that the gas industry is passing into oblivion. It does not realize that the gas industry is ceasing from doing the obvious, and is settling back into an unostentatious plane of scientific research, which it will never know of save through the results that are accomplished. The chemist does not conduct his experiments in the public square, nor does the gas engineer erect his improved retort in a circus tent.

But it is not well that the public should gain the impression that the industry is dead. An interested and appreciative public is just as necessary to the progress of the gas manufacturing business as the gas industry is necessary to the public.

Many gas companies and many men, both in the production, and in the distribution ends of the industry are accomplishing splendid results towards educating a sympathetic and understanding public. Are you, individually, doing your part?

If not, put your shoulder to the wheel. Neglect, for the moment, your technical matters and study the mind of your neighbor. Find out why he has lost his faith in gas, if he has, and demonstrate to him how greatly he is mistaken.

Better Gas Rates Necessary

Electrically heated range and appliance manufacturers are spending large sums of money in advertising, largely on account of the special rates that so many electric lighting companies are now offering to domestic cooking consumers. It has been estimated that there are already at least 3,000 communities in the United States in which electricity is sold for cooking purposes at the rate of five cents per kilowatt hour or less. One company has found that in actual practice a rate of two cents per kilowatt hour will result in an electric bill about equal to the gas bill where gas sells at one dollar per thousand cubic feet.

It is evident, therefore, that the question of gas rates is now of even more importance than it has ever been in the past. Electric appliance manufacturers are advertising in national mediums because the electric light companies are establishing rates that will enable the publicity now being given to electric cooking to bring results. If all electricity is now and always had been sold at flat rates, as is the case to a very considerable extent with gas, these concerns could not afford to give their product the publicity they now give it. Where it is sold on a scientific rate basis, at the actual cost of supplying it to a particular class of consumer, plus a reasonable profit, they can.

The great weakness of most gas rates lies in the fact that they do not take into consideration the load factor. The unprofitable consumer having a very low load factor pays a rate no higher than the profitable consumer having a high load factor. It is evident that it is not fair to the company to sell gas at the established rates to the low load factor consumer, nor is it fair to the high load factor consumer to ask him to pay the flat rate. In other words, the old style flat rate is not a just rate.

Unless more reasonable and equitable rates, in which the load factor is given due consideration, are adopted, gas companies are bound to lose some of the most profitable domestic and industrial heating to the competing electric companies, which have adopted scientific methods of charging for their service.

Many gas companies have already come to a more or less clear understanding of this condition. There are already many companies using rates in which the load factor is given due consideration. These companies are prosperous. The system of charging, however, has not yet become so universal in the gas business as it has in the electric. It can be said without fear of contradiction that there are not over 3,000 communities in the United States where differential, block system or quantitative rates are used for the sale of gas.

Coal Production in 1915 Exceeded That in 1914 by 18,094,010 Tons

The production of bituminous coal and anthracite in the United States in 1915 amounted to 531,619,487 short tons, valued at $686,691,186, an increase, compared with 1914, of 18,094,010 tons in quantity, and of $5,200,543 in value, according to the U. S. Geological Survey.

Of this output, 442,624,426 short tons, valued at $502,037,688, was bituminous coal and lignite, and 88,995,061 tons, valued at $184,653,498, was Pennsylvania anthracite.

Pennsylvania, with an output of 157,955,137 tons of bituminous coal and 88,995,061 short tons of anthracite, ranks first among the coal-producing States. West Virginia, with a production of 77,184,069 tons; Illinois, with 58,829,576 tons; Ohio, with 22,134,691 tons, and Kentucky, with 21,361,674 tons, follow in order.

Thirty states and the territory of Alaska contributed to the total.

To produce this coal, 734,167 men were employed for an average of 209 days. The production by states was as follows:

State	Total quantity	Total value	Number of employees	Number of days worked
Alabama	$14,927,937	$19,006,043	22,501	223
Alaska	1,400	3,300	.....	...
Arkansas	1,652,106	2,959,456	3,751	149
California, Idaho and Nevada	12,503	32,054	36	285
Colorado	1,624,980	13,509,264	12,372	194
Georgia	134,496	231,801	308	197
Illinois	58,829,576	64,822,471	75,610	179
Indiana	17,606,152	18,637,476	22,777	179
Iowa	7,614,143	13,577,698	15,549	229
Kansas	6,824,474	11,300,650	13,200	184
Kentucky	21,361,674	21,494,008	28,119	186
Maryland	4,180,477	5,330,845	5,004	242
Michigan	1,156,138	2,372,797	2,549	198
Missouri	3,811,503	6,505,918	9,173	186
Montana	2,780,755	4,526,500	3,158	201
New Mexico	3,817,940	5,481,301	4,205	262
North Dakota	528,078	708,072	500	219
Ohio	22,434,691	24,207,075	40,053	142
Oklahoma	3,681,580	7,435,906	8,457	167
Oregon	39,231	111,240	151	208
Pennsylvania, bituminous	157,955,137	167,419,705	174,503	220
South Dakota	10,263	16,384	35	155
Tennessee	5,730,361	6,479,916	8,948	220
Texas	2,088,908	3,445,487	5,087	233
Utah	3,108,715	4,916,916	3,504	208
Virginia	8,122,596	7,902,934	8,959	235
Washington	2,429,695	5,276,290	4,850	169
West Virginia	77,184,069	74,561,349	75,882	208
Wyoming	6,554,628	9,555,804	7,244	201
Total bituminous	$442,624,426	$502,037,688	557,615	203
Pennsylvania anthracite	88,995,061	184,653,498	176,552	230
Grand total	$531,619,487	$686,691,186	734,167	209

Great Industrial Problems To-day Are Human, Not Mechanical

Frances A. Keller, in an Article in the Engineering Record, Asserts That the Engineer Has Been Revealed as Foremost Agent In the Nationalization of Business

In the selection of 30,000 engineers to take an inventory of industries, to serve as the basis for mobilization, the Naval Consulting Board is revealing the engineer as the future big civic factor in individual plants and as the foremost agent in the nationalization of business, asserts Frances A. Keller, in an article in a recent issue of the *Engineering Record*. This inventory will not only give the government information, it will give the engineer training and a vision of industrial organization and responsibility which he has but dimly realized as he struggled with world-wide problems in his corner of the plant.

When the industry was content with a "welfare" department or secretary for the benefit of its men, the social worker, the reformer, the misfit in regular departments, the outside agent, was placed in charge. The Safety-First movement, combined with first-aid work, spelled the doom of the irresponsible outside agent, and placed the engineer in the saddle. With the growth of functional management and scientific management, the engineer has become even more important. And now comes the call of the nation for the development of industrial resources and the conserving of materials. Already there are signs that this is but the beginning of national service for the engineer.

The Great Problems

The great problems before industry to-day are not mechanical, but human—the conservation of men and the regularizing of industry, which will stabilize the labor supply. America is short of men. Many immigrants have returned to the home country; many others will go at the close of the war. Canada and South America are competing for immigrants. Canada is even now invading America to fill her vacant farms.. We may be sure of one thing, industry cannot obtain workers after the war upon the same terms as before. Human beings have become more precious, and those in the trenches that return to hard labor will be less easily adjusted to peace conditions.

Labor Turnover in Industries 200 Per Cent

The average labor turnover in America is about 200 per cent in the industries upon which America must primarily depend in time of war. In other words, for every 100 kept at work 300 are employed. This is sheer waste of men due to lack of combination in the regularizing of industry and employment of men.

In the past we have relied upon the economist and the professor to tell us about unemployment, irregularity of work, vocational education and similar industrial questions. The laboratory for study has been the employment agency and the lodging house, and the remedy—a law. In the future it will be the engineer who studies the problem in the plant, and the remedy will be the adoption of measures within industry itself which will make laws as unnecessary as they are useless to deal with such questions.

We are building our labor distribution system without plans or specifications—a base here and a girder there, over which only an aeroplane could take us. When the engineer grapples with the problem of distribution he will give us a structure on which men can and will travel to work best suited to their needs.

Louisville Gas Co. Assessed at $10,841,492

The Kentucky State Board of Valuation and Assessment, passed on the assessment of the Louisville Gas & Electric Company, June 24. The company was valued at $10,841,492, an increase of $2,591,492 over last year's assessment.

Industrial Fuel Salesman Should Have Technical Knowledge and Know How to Use It

The technical salesman is the ideal salesman, but there are not a great many of such men to be had. Yet the industrial fuel salesman must, of necessity, possess a very considerable amount of technical knowledge, and know how to use it. These views were expressed by C. E. Chapple at the Mid-Year Conference of the National Commercial Gas Association, held in New York City, June 8-9. Mr. Chapple stated further that:

In the larger companies there is room for both the technical salesman and the well informed practical salesman and I believe we must have both of them. The idea of limiting the sale of industrial appliances to purely technical men I do not believe will ever work out.

As to the question of the method of payment of the industrial man, I do not believe that paying on a bonus or commission basis is as good or as just as paying a straight salary. The industrial man has sold nothing until his customer is burning gas in the appliance sold and is satisfied with it. More time is often called for in satisfying the consumer after the appliance is sold than was needed to consummate the sale. If the industrial man's compensation depends upon commissions he is apt to shirk this important work and you must have some one else to follow up the job. The commission man, even when he finds a proposition where an existing appliance might be converted from solid fuel to gas by the sale of a moderate priced burner, is very apt to endeavor to sell a higher priced appliance for the purpose in order to exact a greater commission. This is an injustice to the consumer and might well result in the loss of any sale.

One of our very large gas appliance concerns has recently abandoned the proposition of commission payments to its salesmen and has put them on a straight salary basis together with a bonus for exceptionally good work. This change was made on account of the foregoing reasons.

Another point is that there is a great amount of work which an industrial salesman is called upon to do which may not result in the sale of appliances; missionary work, bettering conditions in a plant already using gas, saving a consumer who is about to change to another fuel on account of dissatisfaction for reasons which may be overcome.

A commission man is not interested in such propositions, is not paid for such work and should not be expected properly to take

care of it. Such cases are properly taken care of in New York by an engineering department available and informed on that kind of work. Most companies do not have such departments.

I think the tendency is to expect too much of the industrial man, to consider his work from the same viewpoint as the domestic appliance salesman. He must be posted as to the merits of his appliances, must know a great deal about the nature and requirements of his customers' business and he does not do justice to a consumer if he rushes his sale in order to get to John Jones or Smith & Co. to sell them appliances.

The system of payment of the industrial salesman is an important question, worthy of more consideration than it has been given in the past. Do not expect too much of the industrial man and do not try to keep him down.

Advocates Establishment of Industrial Research Stations

The excellent features of Senator Newland's bill proposing to establish industrial research stations in connection with the land-grant colleges in the several states have been previously explained in these columns. No particularly objectionable features have come to light and the bill would be likely to be passed were it not for the apathy of those who have most to gain from its enactment.

This bill is not a scheme to find jobs for dreamers. Its benefits accrue to the land-grant colleges only because these solely can legally receive federal appropriations at present. As contrasted with any central laboratory it creates many distributed centers for industrial research and will give local industries better opportunity to enlist scientific aid.

Science is anxious to be of greater service to industry. Industry, on the other hand, does not realize science's past contributions to its welfare and consequently cannot appreciate the value of future aid that would result from more scientific research.

The marvellous electrical developments of to-day would be impossible without knowledge based on the researches of two scientists working with no apparent thought of the utilitarian value of the application of their discoveries. Faraday discovered the fundamental principles of electro-magnetism, upon which depends the operation of all dynamo electric machines. Maxwell codified Faraday's discoveries into a complete theory to guide all future investigators. Without this fundamental knowledge the inventions of Edison, Bell and Marconi would not have been possible.

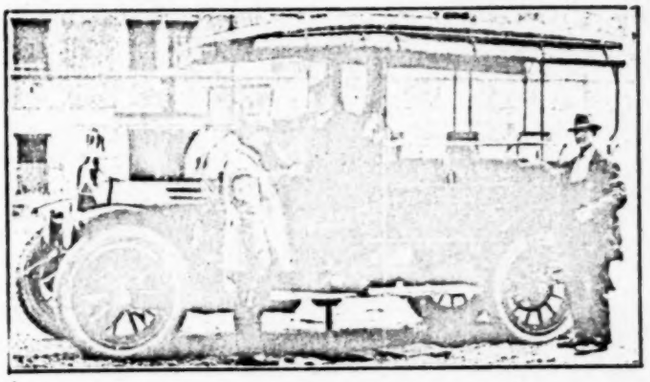
Many other examples can be cited—the development of the dye industry by the Germans, the adapting to commercial liquefaction and separation of gases of Thomson and Joule's theory of temperature reduction through the expansion of a gas in a porous plug, or the improvement in the efficiency of incandescent lamps by investigation of the melting points of metals.

This is the day of organized research. Frequently the individual investigator repines at the futility of trying to compete with the trained staffs of big manufacturing companies with every facility at hand. Under a central administrative office individual research could be conducted effectively and thus would the world benefit from work which individuals hesitate to undertake unaided. Any financial encouragement given the research scientist cannot but ultimately redound to the benefit of humanity.—*Journal of Electricity, Power & Gas.*

The Motor Truck in the Gas Field

Gas Companies Have Found a Wide Range of Uses for Motor Trucks, Particularly of Types Fitted with Special Bodies and Auxiliary Power Appliances

Public service corporations who are supplying gas for lighting and heating purposes have found a wide range of uses for motor trucks, particularly for machines fitted with special bodies and auxiliary power appliances. The trucks, it is said, have effected



POWER ATTACHMENT ON EMERGENCY TRUCK OPENS AND CLOSES STUBBORN VALVES

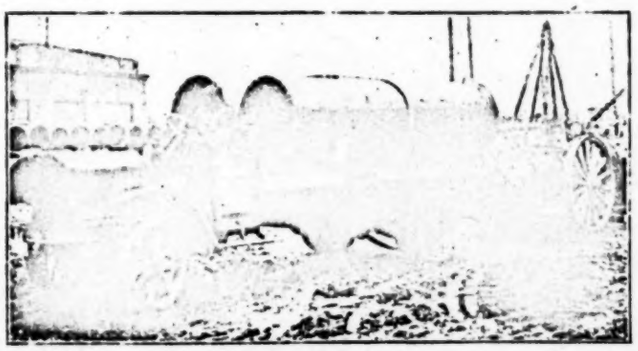
large savings in the cost of delivering materials, the extension of lines and the general maintenance of plants. An idea of the extent to which light and power companies are taking up the motor truck is evidenced by the fact that, during the past week, 36 different public utilities have placed orders for 93 trucks with the White Company of Cleveland alone.

In the delivery of mains, service pipe, meters, mantles, stoves, heaters, lamp posts, brick and gas appliances, for the transportation of workmen and inspectors, in miscellaneous freight service between depots, in the haulage of coal, coke and other supplies and in many other phases of haulage work motor trucks have been found to be efficient, dependable and highly economical.

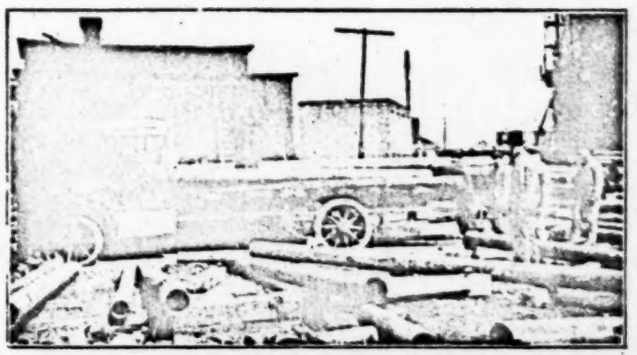
Trucks equipped with a single or double drum power winch and niggerheads are used in digging holes for lamp posts, in pipe cutting and threading.

Many of the trucks purchased by gas companies have brackets on the sides for carrying long pipe while others have extra long bodies which permit the carrying of long sections of pipe without any danger of excessive overhang. In field work where pipe lines are extended over long distances the trucks with an extra long wheel base make it possible to easily handle pipe up to 20 ft. in length. Many of the companies use the power of the truck to load and unload heavy pipe over the sides of the truck.

While the motor truck is not a new servant in the employ of gas and water companies, new conditions have arisen recently to demand the installation of new and more efficient equipment, and the speed and performance of the truck makes it a logical unit for the work.



WITH TRAILER MOTOR TRUCK IS ECONOMICAL MEANS OF HAULING HEAVY PIPE



LONG BODY AN ADVANTAGE IN MANY CASES ON GAS COMPANY WORK

The rapid increase in the population in outlying districts has necessitated considerable new construction work and the extension of gas mains. These extensions have formed haulage problems of great importance to the companies.

A truck can operate in an almost unlimited territory and by means of its greater carrying capacity, larger crews and larger quantities of materials and tools can be transported at a great saving of time.

Majority of Industrial Fuel Salesmen in Country Men of Little Technical Training

Ideal Men for Work Are Combination Type, but, if Such Are Not Available, Well Equipped Salesman is Preferable to Straight Technical Engineer

The ideal young man to select for development into an expert industrial salesman would be one with engineering training, equipped with sound business and factory sense, and at the same time possessed of selling ability. Ordinarily, the industrial gas field does not attract a graduate engineer, on account of the remuneration, although there are some graduate engineers in this country now who have taken up industrial fuel work in gas companies and whose hope is that the industrial position will prove to be a stepping stone to higher gas company work. These statements were made by G. M. Karshner, of the Consolidated Gas Company of New York, who went on further to state:

INDIFFERENT MEN REMAIN INDIFFERENT INDUSTRIAL MEN

It seems to me, judging from results so far secured, that a gas company will do better if it selects for this class of work men who have had a comparatively good education on general lines, and are consequently able to study combustion, construction of appliances and manufacturing processes. The ordinarily intelligent man can acquire from books of various kinds enough engineering knowledge to get him past the large percentage of the problems that come up in his work. All gas companies have technical engineers who can be consulted by a man of this kind when some particularly difficult problem requiring technical information is met.

Selling ability, coupled with intelligence inside of a manufacturing plant seems to work out most of the problems met in the various cities. I do not wish to be understood as saying that technical knowledge is not desirable in an industrial fuel salesman, but I do believe that the combination of technical man and salesman is rare, and I believe I would rather take my chances, when I cannot get a combination man, with a well equipped salesman, rather than a straight technical engineer, providing I could use only one man. Where a company is large enough for more, an engineer could be used to assist in the selling of appliances and applications of gas in an advisory capacity.

REASON FOR FAILURE TO GET RESULTS

Of late years, we have heard some complaint from gas company managers, that they have hired so-called "industrial fuel engineers" and have not been able to get business results.

One of the main reasons for experiences of this kind has been that there has been hired an industrial man who, although he has been in the business for a few years, has not been equipped with a combination of selling ability and manufacturing sense.

Industrial gas conditions are different in different cities. I do not refer to prices of gas, calorific value, etc., but I refer to the actual articles manufactured and actual factory conditions. If the man is not the proper kind of an industrial man, he may not be able to apply experience gained elsewhere, and do the work expected of him by the manager; consequently the manager blames industrial fuel men in general.

73,414,500 Gallons of Water Pumped by 5,500,000 Cubic Feet of Gas

Five and one-half million cubic feet of natural gas, at 9 cents per thousand, pumped the 73,414,500 gal. of water consumed at Fort Smith, Ark., during the month of May, according to Chief Engineer Golden, of the city water department. The water plant pumped an average of 2,377,890 gal. of water per day, using 146,145 cu. ft. of gas.

RAY CASE, superintendent of the East Deerfield Gas Works, is making an automobile tour of Northern Vermont and Canada.

Development of Haber Process May Have Serious Influence on Ammonia Prices

Because the raw materials for the forming of synthetic ammonia by the Haber process are available from air and water in practically inexhaustible quantities, its successful development may constitute a serious menace to the coal-distilling industries.

Haber and his fellow-workers, in the course of a long and exhaustive experimental inquiry into the conditions under which hydrogen combines with nitrogen, have succeeded in preparing mixtures of gases containing from 2 up to 18 per cent of ammonia, by passing mixtures of nitrogen and hydrogen, at pressures varying from 120 to 200 atmospheres, through pipes containing catalysts—such as uranium and osmium—heated to temperatures ranging from 932 deg. Fahr. to 1292 deg. Fahr. High pressures and temperatures were found to favor the rate of combination of the nitrogen with the hydrogen, but the yield of ammonia at the higher temperatures was low.

A better yield was obtained at the lower temperature, but the rate of combination was found to decrease rapidly with a falling temperature.

The nature of the catalyst, also, had a very important influence on the velocity of the reaction. The ammonia which is formed may be easily separated in the liquid form by cooling the gases, and the unchanged mixture of nitrogen and hydrogen is returned to the reaction chamber for further treatment.

Hydrogen may be obtained by the electrolysis of water, by the action of steam on iron, or from water gas, and it is also produced in large quantities in the electrolytic manufacture of alkali. The nitrogen is preferably prepared from air by liquefaction and for this process is thus available from air and water in practically inexhaustible quantities, so there is no limit to the possible production.

Plant for the manufacture of ammonia on a large scale by Haber's method was in course of erection in Germany at the outbreak of the European War, but no information regarding its operation is yet available. It is safe to predict, however, that the development of this process, if it proves to be a commercial success, will not render the recovery of ammonia in connection with existing coal-distilling plants unremunerative, though it will undoubtedly have a very serious influence on prices.

Heat Passes Up Through Vertical Central Passage in New English Gas-Heated Crucible Furnace

A patent has recently been granted in England on a gas-heated crucible furnace, in which the crucible is of annular form and so related to the furnace that the heat from the burner passes up through a vertical central passage within the crucible, and returns between the outer walls of it and the walls of the furnace, thus providing for the heating of the crucible both within and without.

Commercial Benzol Yields 12 Per Cent More Power Than Petrol

Commercial benzol yields 12 per cent more power than petrol and is equally good in regard to elasticity and prompt starting. Before the war it was rapidly advancing in favor as a competitor of petrol for the driving of internal combustion engines. In 1905 the benzol production in Great Britain was 18,000,000 gal. It increased steadily in volume until it attained a total of 80,000,000 gal. in 1912.

Reduction in Rates Becomes Effective at Keokuk, Iowa

The reduction in gas rates to from $1.25 and $1.15 per thousand cubic feet at Keokuk, Iowa, became effective July 1. In the past a rate of $1.35 per thousand cubic feet for the first 2,000 ft. had been charged. There was a discount of 10 cents for prompt payment of bills which made the net rate $1.25 per thousand. The reduction is from $1.35 to $1.25 per thousand. With the ten cent discount, this amounts to $1.15 per thousand, as the net rate.

Items of Interest from Various Localities.

Desires 55 Assistants in Making Chicago Gas Investigation

Prof. E. W. Bemis, the City's Expert, Asks for Appropriation of $7,000 Per Month to Pay Salaries of Assistants in Delving into Books of People's Gas Light & Coke Company

The investigation of the books of the Peoples Gas Light & Coke Company is going to be a rather expensive undertaking for the city of Chicago.

Edward W. Bemis, the expert retained by the city council committee on gas litigation, has submitted a list of the employees he wants to aid him in his work.

According to the figures submitted there will be a staff of 55 assistants and a corps of messengers and stenographers, calling for a monthly expenditure of approximately $7,000.

As outlined the force will, in part, be constituted as follows:

Seven department engineers at $225 to $250 a month.
Five assistant engineers at $200 a month.
Five assistant engineers at $150 a month.
Eight junior engineers at $125 to $145 a month.
Two draftsmen at $90 to $100 a month.
Three cost analysts at $90 to $110 a month.
Two junior clerks at $70 to $100 a month.
Two inspectors at $70 to $100 a month.
One senior clerk at $140 a month.
Twenty field assistants at $70 to $125 a month.

This force will prepare data for the trial of the city's suit to enforce the gas rate ordinance passed five years ago.

Pays Tribute to Management of Baltimore's Gas Company

In commenting on withdrawal of the offer to supply Baltimore with natural gas, which was noted in these columns last week, a local newspaper states as follows:

"It has been evident from the beginning that the public was exceedingly lukewarm in regard to the proposal. It did not view favorably the plan of a competing gas company under any circumstances, and the price of the product to the consumer did not impress the city as being low enough to warrant tearing up pavements that had just been put down. Refusal of the old company to negotiate presented an obstacle to the project that seemed insurmountable.

"Now that the deal is formally off, there is one point worth emphasizing. It is the demonstration of the value to a corporation of gaining the good will of the public by progressive management and by adopting a policy of 'the public be pleased.'

"The Consolidated Gas Company, under Mr. Aldred's management, has made friends of the people of Baltimore. It has been conducted on a broad-gauge plan that has won for it commendation on all sides. In addition to this, Mr. Aldred has shown interest in the development of enterprises that have redounded much to the city's growth and welfare. He has been instrumental in bringing capital here from the outside, and in other ways has been a powerful factor in the development of the city's industrial interests. If he has been prompted by self-interest in taking this course, he is fairly entitled to the by-product he has reaped in the way of general desire to see his company get a square deal."

Gas Receipts Increase Despite Cheaper Rate

Reduction in the price of gas from 90 to 80 cents, which became effective, Feb. 1, has not decreased the revenue of the Richmond, Va., City Gas Department, according to figures given out by Inspector Joseph M. Shelton. On the contrary, the receipts of the department for the four months ending May 31, were in excess of those for the same period of the previous fiscal year.

Since the rate for illuminating and fuel gas was reduced from 90 to 80 cents for each 1,000 cu. ft., the number of consumers have increased by more than 1,000, as is shown by new meters which have been installed.

"For some time," said Mr. Shelton, "the gas works have been operating under ideal conditions, due to the wet weather. Dry seasons of any length seriously affect the manufacture of gas, and when such conditions again obtain, I am certain that the reports of the department will not be so glowing. It would be entertaining a false hope to believe that the receipts of the department will continue to grow in the same proportion, despite the lower rate."

For February, March, April and May, 1915, when the 90-cent rate was in force, the receipts of the department aggregated $41,171, figures compiled by Mr. Shelton show. For the same four months of 1916, under the 80-cent rate, the total receipts were $43,050.53, giving an increase of $1,879.53.

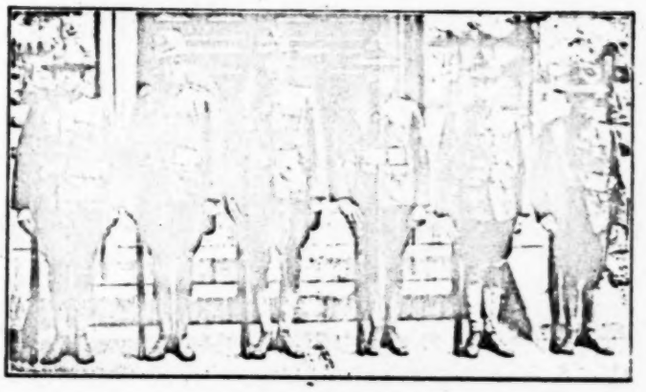
The Gas Works is regarded as one of the city's best investments having always been a big revenue producer.

Charlton, Mass., Electric Light Users Revert Temporarily to Kerosene

Following a storm on the evening of July 8, the tenants of electrically-lighted houses on Charlton Common, at Charlton, Mass., reverted temporarily to kerosene. Up to the time of the latest reports received by this journal, workmen of the lighting company were still seeking the source of the trouble in the electric system.

Empire Gas & Electric Company Employees Answer the Call to National Service

Eight employees of the Empire Gas & Electric Company of Auburn, N. Y., have enlisted in the National Guard for service along the Mexican border. Six of them are shown in uniform



GAS COMPANY EMPLOYEES WHO ENLISTED FOR SERVICE ALONG MEXICAN BORDER

in the accompanying illustration. From left to right they are: I. H. King, William Graney, W. H. Ward, H. G. Storke, F. H. Whipple and A. Nicholson. The others who enlisted are B. M. Smith and A. E. Mosso.

May Use Gas at Boston High Pressure Fire Service Station

As the result of a dispute in regard to the rates to be charged for electric power in the new high pressure fire service station that is to be built on the Charles River embankment in Boston, gas may be adopted to drive the pumps. The suggestion was made after Commissioner Murphy of the public works department had inspected the high pressure station in Philadelphia, where gas has given satisfactory results.

Gas Company Spends Two Cents to Reurn One

Members of the Bayonne (N. J.) Republican Club smiled broadly at a letter, from the Public Service Gas Company, read at a recent meeting.

It was stated in the letter that the club had overpaid its last month's gas bill by one cent, and a postage stamp was enclosed to balance up the account. In view of the fact that it cost the gas company two cents to return the overcharge, much favorable comment was expressed.

The letter was signed by Manager R. A. Clendenning of the Bayonne office.

Cleveland Gas Meeters Hear Myron T. Herrick on What Preparedness Did For Europe

Proposition Made That Americans Raise Large Sums of Money to Present to Europe at End of War With Simultaneous Appeal for Disarmament—Described Events in Paris at Outbreak of War

The somewhat startling proposal was made by Ex-Gov. Myron T. Herrick of Ohio, in an address to the Cleveland Section of the Gas Meeters, June 23, that a great sum of money be raised by Americans to be presented to European countries at the end of the war, with a simultaneous proposal for disarmament.

Mr. Herrick stood on a little platform of rough planks. Before him 150 Gas Meeters and their families were standing. The orchestra struck up the Star Spangled Banner. This stirring scene brought to an end the introductory event of 1916-17 Cleveland Gas Meeters.

For nearly two hours, the Cleveland Meeters and their families listened to the address of Ex-Governor Herrick on "Preparedness in America and What Preparedness Did for European Nations."

He recounted events in Paris at the outbreak of the European war, leading up to the time when the Germans were outside of Paris and the capitol had been removed to Bordeaux.

He concluded his address by proposing that an undreamed sum of reconstruction money be raised by Americans to present to European countries at the close of the war, with the simultaneous appeal for disarmament.

President M. B. Daly introduced Mr. Herrick, and, at the conclusion of his address, paid glowing tribute to him.

The evening was enlivened by music and dancing. A splendid orchestra under direction of H. P. Badbau made a decided hit.

The Meeters were treated to some vocal music when Mrs. H. P. Badbau, concert singer, favored the audience with several selections. Mrs. Badbau donated her services. At the conclusion of her last solo she was warmly congratulated by President Daly.

Miss Ruth Phillips, a singer who had appeared before Meeter parties before, also sang several solos. Miss Phillips likewise donated her services.

A quarter-pound box of candy was presented to each lady attending, and each man was given several cigars.

Indicate Advantages of Heat Unit Gas from the Economy Standpoint

In No. 22 of a series of papers prepared for the consuming public on "lower gas bills," the Peoples Gas Light & Coke Company, of Chicago, explains *why* heat unit gas is cheaper in a manner thoroughly comprehensible to the layman. Some of the paragraphs read as follows:

Lower gas bills instead of considerably higher gas bills—that's the direct advantage small gas consumers will derive from "heat unit" gas. The facts are as simple as A. B. C.

"Heat unit" gas can be made for less than "candle power" gas, therefore sold for less, although not enough less to cut the price much. But "heat unit" gas and the proposed rates, the company believes, will produce greatly increased use of gas in business and industry. This new business from big consumers will increase the average sales of gas per customer, without proportionately increasing the company's expense. In other words, the higher this average sale, the lower average cost per thousand to make and sell. The price to the small consumer can be lowered accordingly.

Then further economies should be possible in an up-to-date coal gas plant, such as we want to build. These, too, would be applicable to price reducing.

How much will the total reduction be? We cannot truthfully say, any more than you can say what next month's grocery bill will be. We believe it will be considerable. The only way to know is to make a start, as we have proposed, and work it out.

But the advantage of our proposal, to the small consumer, is much greater than the difference between the present price of gas and any proposed or prospective price. None of us can afford to ignore this and the reason for it, namely:

> The 22-candle power gas now furnished cannot be sold any more for 80 cents a thousand. The particular oil required for making it has become too expensive and will continue to be so. The price of this "candle power" gas must go up—probably 95c a thousand unless "heat unit" gas and new rates are soon authorized.

In addition several inquiries are answered. In reply to one which states, "your proposition to increase the price of gas, when 'all the world' knows it is already away too high, will make excellent propaganda for public ownership," the company answers: "We are not proposing to increase the price. As explained above, we want to lower the price of gas; which is already the cheapest thing you buy, considering the work it does."

Answering another correspondent,—who asks: (1) Will a customer using 1,000 feet of "heat unit" gas get the same rate as the user of 3,500 and up to 50,000 feet? (2) My gas bill runs $20 at present; what reduction will I get on "heat unit" gas? (3) Will it be necessary for best lighting results to use mantles with "heat unit" gas?—the following explanations are given: (1) Our tentative proposal to the city contemplates the same rate to all up to 25,000 feet. (2) Your immediate reduction would be to 78 cents a thousand and a further reduction as explained above. (3) Mantles will be necessary for the best light but the saving on the quantity of gas used will pay for equipping with, and maintaining, mantles, and you will have three or four times more light.

Sixteen Hundred and Twenty Ranges Sold in Toronto During Gas Range Week

Approximately 1,620 gas ranges were disposed of by the Consumers' Gas Company of Toronto, Canada, and the various dealers who co-operated in the recent gas-range week in that city.

The result was not obtained by individual effort, but by enthusiastic co-operation on the part of dealers, the departmental stores, the house furnishing companies and the hardware and range dealers.

One could not pick up any Toronto newspaper without being informed on almost every page that "Gas Range Week, 1916," had arrived with its special inducements to those householders not already cooking with gas. Every store advertised its own special make of gas range, pointing out the desirability of cooking by gas with its particular range. The reader was confronted with cuts of all kinds of ranges, from the humble "Cooker" to the "Queenly White Enamel Cabinet Range."

The housewives' eyes were made to glisten reading the various descriptions and capabilities of gas ranges. It must have been a difficult matter to decide which make of gas range to buy.—they all looked so neat and clean, so business-like and capable, and all told the same tale of a cooler, cleaner, healthier kitchen, combined with less work, less worry, less waste of fuel and time, and, a happier and brighter household. The buyers were perplexed as to which way to decide. Only one point was definitely decided upon. That was that a gas range was needed, with the accent on the "gas." All other factors in the purchase were controlled by the pocketbook, and the influence of the salesman's statements regarding his special make of range.

Other methods of publicity besides newspaper advertising were adopted. Every few blocks large posters were displayed pointing out the beauties of various makes of gas ranges, or inviting the public to see the "Special displays at all dealers" during Gas Range Week, 1916. The Consumers' Gas Company's and dealers' vehicles displayed cards bearing the words "Gas Range Week, 1916." The show windows of the various stores were also placarded with the same words—all of a uniform lettering and coloring—black letters on a white ground with the capitals lined with aluminum—the nearest approach to "Gas Range" colors obtainable. All of the dealers made special displays, both in their windows and in their showrooms during the campaign. Some of the more enterprising made a special feature of an "All Gas Kitchen," and gave demonstrations of cooking by gas.

Another method was the Gas Range Week Free Guessing Contest, in which prizes to the value of over $200 were awarded.

A feature of the campaign was the large percentage of sales of cabinet gas ranges as compared with the percentage of sales of the old type range.

Satisfaction was expressed by the dealers in regard to the results of the campaign. Co-operation has cemented the friendship between them and the gas company, and plans are already under way leading to further co-operation, which will tend to bring more business to both.

Indiana Coke Company to Furnish Gas to Citizens Gas Company

The Indiana Coke and Gas Company has entered into a contract with the Citizens Gas Company of Terre Haute, by which a million feet of gas per day may be taken from the new coke plant of the former for local consumption. A 4-in. main, extending from the gas company's plant to the coke plant is now being laid.

The new coke company will buy gas from the Citizens Gas Company to start ovens and when the experimental days are over will sell gas to the gas company.

Vice-President Bogart stated to-day that, at the present ratio of consumption, the arrangement made with the gas company would not mean much of a saving over the present cost of manufacturing gas, but both concerns hoped to develop the commercial use of gas, and with the increased output reduce the cost of production for all concerned.

The coke company will start operations by Oct. 1. It has a battery of 30 ovens.

Commission Reports on Rhode Island Gas Companies

The fourth annual report of the Rhode Island Public Utilities Commission has been issued, for the year ended December 31, 1915. The Commission supervises four gas companies—those of Providence, Pawtucket, Woonsocket and Newport.

The Providence company is erecting a new water gas plant, and has made many improvements in its distribution system. The new 3,000,000 cu. ft. gas holder in the western part of Providence is supplying gas through a station governor to a new circulating system that will feed into the old system at various points; 793 miles of 12 to 36 in. iron pipe was laid.

The Pawtucket company has increased its patronage by 600 customers during 1915. Shaking grates have been added at the regenerative and recuperative furnaces.

The Newport company has installed a new coal gas process, which is expected to greatly reduce costs.

British thermal unit tests show 590 to 649 heat units per foot of gas, with candlepower per 5 ft. of gas ranging from 12 to 19, for the various companies.

Personal Notes

MARTIN B. DALY, president and general manager of the East Ohio Gas Company, of Cleveland, Ohio, has been appointed a member of the commission to take care of the families of soldiers absent on duty in the National Guard, by Mayor H. L. Davis of that city.

C. A. GARDNER AND GEORGE HORSLEY, electrolysis engineers of the East Ohio Gas Company of Cleveland, Ohio, have moved their offices from No. 2 Works to the main office building so as to be in closer touch with the engineering department.

M. K. TURNER recently resigned from the sales department of the Pacific Light & Power Company of Los Angeles to join the sales force of the Smith-Booth-Usher Company of that city.

JOHN W. GOLDEN, vice-president of the Savannah Gas Company, recently completed his thirtieth year of service with the company.

WILLIAM NEWBIGGING, the English gas expert, has been retained by Prof. E. W. Bemis, for the city of Chicago, to make a general survey of the gas situation in that city.

CHARLES L. PILLSBURY, consulting engineer, of Minneapolis, has been retained by the city as an expert on the Chicago gas situation survey.

GEN. MORRIS SCHAFF, of the Massachusetts Gas & Electric Light Commission has had conferred upon him the honorary degree of Doctor of Laws by Otterbine University.

WILLARD F. HINE, gas engineer, of the New York State Public Service Commission, First District, has been directed to begin experiments at once, in connection with the New York City Department of Water Supply, Gas and Electricity, to determine whether the British thermal unit should be established as the standard for illuminating gas within the jurisdiction of the commission.

JAMES T. LYNN has been appointed president of the Public Lighting Commission of Detroit, succeeding Charles H. Bryan.

ROBERT MONTGOMERY, commercial manager of the Louisville Gas & Electric Company, has been elected temporary president of the Ad Club, of which body he has been one of the chief organizers.

M. L. HIBBARD, general manager of the Union Light, Heat & Power Company, at Fargo, North Dakota, has been elected vice-president of the Fargo Commercial Club.

Societies and Associations

THE COMMERCIAL DEPARTMENT OF THE HARRISBURG GAS COMPANY held its annual basket picnic, July 11, along a creek near Harrisburg. Motor trucks and automobiles carried the gas company employes to and from the picnic.

THE CLEVELAND SECTION OF THE GAS METERS will hold its annual picnic at Avon Beach Park, July 22.

EMPLOYEES OF THE NORTHERN INDIANA GAS AND ELECTRIC COMPANY, and their wives, numbering more than 200, held a "Safety First" meeting at Fort Wayne, June 30. Addresses were made by men prominent in the state and nation. Following them, a banquet was served. S. E. Mulholland, vice-president of the company, made the address of welcome.

THE BROCKTON (MASS.) GAS LIGHT EMPLOYEES' ASSOCIATION will hold their annual outing at Brant Rock, July 22. It is expected that about 80 members will make the trip. A shore dinner will be served at the Peace Haven Hotel, and for the afternoon a programme of sports has been arranged.

Construction Notes

PHOENIX, ARIZ.:—City will vote, Oct. 3, on $600,000 in bonds for municipal electric light and gas plant. J. B. Girard is City Engineer.

SAUSALITO, CAL.:—Two hundred signatures have been obtained pledging support to a proposed company which will furnish gas to Sausalito. A contract has been entered into with George L. Fish to install a gas distribution system. The rate is not to exceed $1 per 1,000 cu ft. It is thought that the system will, in the course of time, be extended to Belvidere, Tiberon and Mill Valley. W. Z. Tiffany is town clerk.

NEW HAVEN, CONN.:—Plans will soon be ready for bids on the erection of two acetylene gas stations for the New York, New Haven & Hartford R. R. Co. at Readville. F. W. Mellor of New Haven is the architect and Edward Gagel is chief engineer of the railroad company.

MERIDEN, CONN.:—The H. Wales Lines Company of Meriden has been awarded a contract to construct the foundation for a new retort house and a 600 ft. coal trestle at the plant of the Meriden Gas Works. The foundation of the retort house as well as the trestle will be constructed of concrete.

IDAHO FALLS, IDAHO:—W. D. Wilcox and J. E. Doyle of Chicago are investigating the situation in regard to the probable immediate consumption of gas in this city. It is their purpose, it is reported, to build a gas plant.

ESTHERVILLE, IOWA:—Work has been started on the construction of a gas plant in this city.

FITCHBURG, MASS.:—The Leominster Gas Light Company is engaged in laying a 4 in. main from Hall to Vassar Street, on Merriam Avenue.

EL RENO, OKLA.:—Electors granted a 25-year franchise to the El Reno Gas & Electric Company, June 30. Work on a pipe line will be started immediately by the producing company with which the El Reno Company holds a contract for a supply of natural gas.

MT. CLEMENS, MICH.:—The Mt. Clemens Gas Light Company is extending its gas lines on North Gratiot Avenue, from Scott Boulevard to the Grand Trunk Spur.

SALT LAKE CITY, UTAH:—Contract has been signed for the installation of nine new gas retorts in the plant of the Utah Gas & Coke Co., Salt Lake City.

CHIPPEWA, WIS.:—The Wisconsin-Minnesota Light & Power Co. has been given permission to tear up pavements for the purpose of laying larger gas mains. The present small size mains throughout the city are inadequate for the present needs, and the quantity of the supply demands larger pipes. The company is also said to be contemplating further improvements.

Financial Notes.

THE TEXAS POWER & LIGHT COMPANY has increased its authorized capitalization from $13,000,000 to $14,000,000. Fred Slater has been elected vice-president and general manager.

THE CONSOLIDATED GAS, ELECTRIC LIGHT & POWER COMPANY has fixed the price at which common stock will be sold to customers on the partial payment plan between July 10 and August 10 at $115 a share.

THE NORTHERN STATES POWER COMPANY'S sales to customers of 7 per cent preferred stock, amounting to $95,500, was larger in June than in any other month since the offering.

THE COLUMBIA GAS & ELECTRIC COMPANY now has two gasoline extraction plants under operation, with a combined output of between 3,000 and 4,000 gallons daily.

THE HUNTINGTON DEVELOPMENT & GAS COMPANY reports gross earnings for May amounting to $35,356, an increase of $15,416. The surplus is $11,977, an increase of $3,449. The surplus for the 12 months ending May 31 was $101,002, an increase of $210,914, leaving a balance of $147,036, an increase of $70,160.

THE CUMBERLAND COUNTY POWER & LIGHT COMPANY reports gross earnings for May amounting to $223,429, an increase of $18,884. The surplus is $20,767, an increase of $4,349. The gross surplus for the 12 months ending May 31 was $2,736,122, an increase of $185,649, leaving a balance of $193,669, an increase of $7,871.

THE CONSUMERS POWER COMPANY reports gross earnings for May amounting to $361,938, an increase of $72,376. The surplus is $132,162, an increase of $29,320. The gross surplus for the 12 months is $4,274,561, an increase of $762,663, leaving a balance of $1,151,605, an increase of $366,113.

THE COSDEN OIL & GAS COMPANY will call a special stockholders' meetings on July 24 to increase the authorized common stock from $5,000,000 to $9,000,000, and also to authorize the issue of 6 per cent notes to the amount of $7,000,000.

THE UNION GAS & ELECTRIC COMPANY has sold to private interests 11,913 shares of the Cincinnati Gas & Electric Company stock, which has been given to the Union Company under a contract, as reimbursement for money spent in extensions and permanent additions. Although the figure involved in the sale is withheld, it is stated to be in the neighborhood of $1,000,000. The proceeds will enable the company to pay off its entire floating indebtedness and will, at the same time, strengthen the condition of the Cincinnati Gas & Electric stock, for the shares will be held as an investment and will not find their way into the hands of dealers.

THE LINCOLN GAS & ELECTRIC LIGHT COMPANY—Cities Service Company, has offered to buy the stock of the company, issuing its own securities in payment therefor on the following basis: For each share of Lincoln stock Cities Service will issue in exchange 35/100ths of a share of 6 per cent preferred stock and 7/100ths of a share of common stock of Cities Service. The privileges of making these exchanges will extend until August 1, 1916, and conversion will be made as of that date. The first dividends to be received on the Cities Service Company preferred and common stocks issued through these exchanges will be the regular dividends, payable September 1, 1916.

THE FEDERAL LIGHT & TRACTION COMPANY reports gross earnings for May amounting to $194,772, an increase of $20,224, or 11.6 per cent. The net income after expenses and taxes have been paid is $58,257, an increase of $2,666, or 4.8 per cent. The balance is $9,666, an increase of $3,010, or 45.2 per cent. The gross earnings for the five months ending May 31 are $1,056,561, an increase of $59,910, or 6 per cent. The net income, after expenses and taxes have been paid is $345,204, a decrease of $89, leaving a balance of $101,216, an increase of $4,369, or 4.5 per cent.

THE KNOXVILLE GAS COMPANY has contracted with the leading restaurant in Knoxville for 100,000 cu. ft. of gas a month.

THE OHIO CITIES GAS common (new stock) after selling down from 63 to 58, had a sharp up-turn, selling as high as 69, reacting to 65.

THE STANDARD GAS & ELECTRIC COMPANY'S entire outstanding balance of 6 per cent collateral trust notes, amounting to $3,000,000, dated June 1, 1913, was paid June 1, 1916, wiping its slate clean of all short term obligations.

THE PACIFIC GAS & ELECTRIC COMPANY will set aside $7,000,000 within the next seven years for the protection of the security holders and the conservation of the corporation's assets.

Current Prices of Public Utility Securities

	Bid	Asked
Adirondack Elec. P.	24	26
Adirondack Elec. P. pf.	77	80
*American Gas & Electric	139	144
*American Gas & Electric pf.	50	52
American Light & Traction	380	385
American Light & Traction pf.	111	113
American Power & Light	68	71
American Power & Light pf.	84	86
American Public Utilities	40	45
American Public Utilities pf.	74	77
Amer. Water W. & Elec.	7	9
Amer. W. W. & E. part'g pf.	14	16
Amer. W. W. & E. 1st pf.	55	60
Carolina Pow. & Lt.	26	30
Carolina Pow. & Lt. pf.	97	100
Cities Service	330	335
Cities Service pf.	88½	90
Colorado Power	23	26
Colorado Power pf.	98	102
*Commonwealth Pr., Ry. & Lt.	64	66
*Commonwealth Pr., Ry. & Lt. pf.	84	86
Denver Gas & Electric gen. 5s	97	99
Empire District El. pf.	88½	93
Electric Bond Deposit pf.	85	—
Electric Bond & Share pf.	99	102
Federal Light & Traction	11	13
Federal Light & Traction pf.	45	49
Gas & Electric Securities	295	—
Gas & Electric Securities pf.	97	102
Laclede Gas	106	107
Northern States Power	87	90
Northern States Power Pf.	95	97
Pacific Gas & Electric	57½	59½
Pacific Gas & Electric pf.	87	90
Republic Ry. & Light Co.	37	39
Republic Ry. & Light Co. pf.	73	75
*Standard Gas & Electric	15	16
*Standard Gas & Electric pf.	39½	41½
Tennessee Ry., Light & Power	10½	12
Tennessee Ry., Light & Power pf.	49	51
Toledo Trac., Light & Power	51	53
Toledo Trac., Light & Power pf.	87	89
United Light & Railways	51	54
United Light & Railways 1st pf.	75	77

*Par value $50

WANTED:—High grade salesmen in all states calling on Gas Companies to handle STOVOIL, a guaranteed rust preventative, as side or main line. Will consider allotting state rights to responsible man. State present line. Correspondence confidential.

SUPERIOR LABORATORIES,
214 Pearl Street - - Grand Rapids, Mich.